

What is claimed is:

1. An image display apparatus comprising:
a light source section for supplying an illumination light;
a display element for modulating a given illumination light into an image light showing an image;
a reflection type hologram for diffracting and reflecting the illumination light from the light source section so as to guide the illumination light to the display element, the reflection type hologram having diffusing properties; and
an eyepiece optical system for guiding the image light from the display element to an eye of a viewer so as to provide an enlarged virtual image of the image.
2. The image display apparatus as claimed in claim 1,
wherein the light source section supplies the illumination light with a plurality of wavelengths.
3. The image display apparatus as claimed in claim 2, wherein the light source section emits a red light, a green light and a blue light.
4. The image display apparatus as claimed in claim 2,
wherein the reflection type hologram has peaks of diffracting reflection efficiency with respect to each of the wavelength of the illumination light emitted from the light source section.
5. The image display apparatus as claimed in claim 1,
wherein the light source section supplies a divergent light as the illumination light,
the reflection type hologram has a positive optical power and changes the illumination light which has a divergent angle of 0 degree into a substantially parallel light.

6. The image display apparatus as claimed in claim 1,
wherein the reflection type hologram separates a zero-order diffracted reflection light from a first-order diffracted reflection light in a different direction, and
the display element is disposed on an optical path of the first-order diffracted reflection light of the illumination light diffracted and reflected by the reflection type hologram and a downstream side of position where the zero-order diffracted reflection light is substantially separated from the first-order diffracted reflection light.
7. The image display apparatus as claimed in claim 1,
wherein the reflection type hologram has a diffusing anisotropy, and makes a diffusing angle of the diffracted and reflected illumination light different in two direction which cross perpendicular to each other.
8. The image display apparatus as claimed in claim 7, wherein the diffusing angle of the reflection type hologram in horizontal direction with respect to the viewer is larger than that in the vertical direction.
9. The image display apparatus as claimed in claim 7, wherein the diffusing angle of the reflection type hologram is larger than that in a direction of a line of intersection between the reflection type hologram and a plane, the plane including: a center of the display element; an emission point in the light source section; and a center of the reflection type hologram.
10. The image display apparatus as claimed in claim 1, wherein the eyepiece optical system composes of a reflection type hologram.
11. The image display apparatus as claimed in claim 1, wherein the light source section has a light emitting diode.
12. The image display apparatus as claimed in claim 1, wherein the display element is a liquid crystal display element.

13. The image display apparatus as claimed in claim 1, wherein a plane of polarization of a first-order diffracted light of the illumination light diffracted and reflected by the reflection type hologram and a plane of polarization of a zero-order diffracted light of the illumination light diffracted and reflected by the reflection type hologram are perpendicular to each other.

14. The image display apparatus as claimed in claim 13, further comprising:

a first polarization element disposed between the light source section and the reflection type hologram;

a second polarization element disposed between the reflection type hologram and the display element, a direction of absorption axis of the second polarization element being perpendicular to that of the first polarization element; and

a quarter wave plate bonded to a surface of the reflection type hologram.

15. The image display apparatus as claimed in claim 14, wherein the first polarization element is a reflection type polarizing filter.

16. The image display apparatus as claimed in claim 2, wherein a light component of the illumination light which enters the reflection type hologram at a same point are diffracted and reflected by the reflection type hologram at different angles according to a wavelength of the light component.

17. The image display apparatus as claimed in claim 1, wherein an emission point in the light source section and an observation pupil of the image display apparatus are optically conjugated.

18. An image display apparatus comprising:

a light source section for supplying the illumination light;

a display element for modulating a given illumination light into an image light

showing an image;

a first reflection type hologram for diffracting and reflecting the illumination light from the light source section so as to guide the illumination light to the display element, the first reflection type hologram having diffusing properties;

a second reflection type hologram for guiding an image light from the display element to an eye of a viewer so as to provide an enlarged virtual image of the image; and

a transparent plate-shaped prism for holding the second reflection type hologram,

wherein the image display apparatus is used with the second reflection type hologram placed in front of the eye of viewer and with the transparent plate-shaped prism facing the eyes,

the image light from the display element enters the transparent plate-shaped prism at an end surface thereof so as to be guided to the second reflection type hologram and is guided to the eye of the viewer by the second reflection type hologram as an enlarged virtual image of the image, and

a light from an outer world transmits through the plate-shaped prism and the second reflection type hologram so as to be guided to the eye, thereby the viewer can simultaneously see an image of the outer world and the virtual image.

19. The image display apparatus as claimed in claim 18, the light source section supplying the illumination light with a plurality of wavelengths, wherein a light component of the illumination light which enters the reflection type hologram at a same point are diffracted and reflected by the reflection type hologram at different angles according to a wavelength of the light component.

20. The image display apparatus as claimed in claim 19, wherein a peak

wavelength of diffraction efficiency of the first reflection type hologram differs from that of the second reflection type hologram.

21. The image display apparatus as claimed in claim 18, wherein the image display apparatus is a glass-type image display apparatus.